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TECHNIQUE FOR MICROSWITCH MANUFACTURE

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16. Abstract

The patent describes a five-step technique for microswitch manufacture: 1. A clad board is inlaid with a precious metal and the board is pressed. 2. One end of the fixed contact containing a precious metal inlay section is curved, and this edge of the precious metal inlay section becomes a fixed contact. 3. Inserts are formed in the unit body and terminal strips are placed through the top and bottom of the base and held. 4. The unit body is held by the base and the sequential contact strips are cut off. 5. Movable stripes are attached to the support of the terminal strips on the movable side and movable contacts are placed opposite the fixed contacts.

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Application for Patent

Name of Patent

Technique for microswitch manufacturing

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Range of Patent Application

1. The present invention is a technique for microswitch manufacturing which consists of five separate processing steps. In the first step, a clad board is inlaid with a precious metal. The board is then pressed. The press forms a unit body which has a series of alternating contact strips. There is at least on terminal strip on the side of the fixed contact. The strip or strips are arranged along one edge of the section inlaid with precious metal. The precious metal section becomes a fixed contact. There are also terminal strips on the movable strip side and these form the support section of the movable strip. The movable strip has movable contacts. The movable strip moves back and forth between the fixed strips. In the second processing step, one end of the fixed contact, containing a precious metal inlay section, is curved and this edge of the precious metal inlay section becomes a fixed contact. In the third processing step, inserts are formed in the unit body and the terminal strips are placed through the tops and bottom of the base and held. The base is made from a synthetic resin insulating material. In the fourth step of the process, the unit body is held by the base and the sequential contact strips are cut off. This separates each of the terminal strips. In the fifth step of the process, movable strips are attached to the support section of the terminal strips on the movable side and the movable contacts are placed in opposition to the fixed contacts.

Detailed Description of the Invention

This invention is a technique for manufacturing microswitches. The most common of the conventional methods for microswitch manufacturing contain the following steps. A belt board is placed in a punch press. This punch press puts out continuous unit bodies with

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*Numbers in the margin are those of the pages in the original text.

alternating series of continuous strips at fixed locations. These are common-strips, close-strips and open-strips. Terminal strips are fixed in the plastic base through inserts formed in the unit body. The serial strips are cut off thus separating the terminal strips. This assembly process is extremely simple compared to methods in which the terminal strips are separately formed and attached to the base. The assembly process very effectively upgrades the precision of interval location between terminal strips.

Contacts of precious metals such as silver are being built into the tips of open and close terminals in many microswitches to achieve highly stabilized connection resistance. But conventional manufacturing techniques using precious metals fasten the metal in the contact section to the terminal strips by welding or caulking. The operation of fastening contact sections of one metal to terminal strips made from some other type of material is extremely difficult and time consuming. Such operations are obstacles to smoothly functioning automation in assembly and manufacturing. They are also an important cause prevent cost reductions. It is also difficult to obtain a balanced strength of adhesion, the locations where the contact materials are adhered locations is not highly precise and both factors are cause for higher prices.

This invention was designed to solve the above problems. We first inlaid belt strips of precious metals in a clad board. Then a series of single unit terminal strips were shaped from the clad board. By doing this there is no need to weld the metal in the contact section to the terminal strips. The invention is a technique for manufacturing microswitches that reduces cost and gives a highly reliable contact structure.

In the following paragraphs, we will use the appended diagrams and describe the invention based on an example prototype.

Figure 1 is a drawing showing the chief components of the microswitch in perspective. This microswitch was produced by the manu-

facturing techniques in this invention. Number 1 is the common terminal strip, 2 is the open-terminal strip and 3 is the close-terminal strip. These three strips are inserted (to be explained later) /3
and fixed into microswitch base 4 to make a solid unit. Two tabs are formed in the upper terminal section of common terminal strip 1 and one of them, 1a, is turned 90° to become the support section for movable strip 5. The other, 1b, becomes the spring stop section. At the upper terminal section of open-terminal strip 2 and close-terminal strip 3, contact section 2a and 3a are formed by a procedure that will be explained later. Contact sections 2a and 3a maintain a fixed interval and are placed so that they are in opposition in up and down movement.

Movable strip 5 is made from a spring quality metal conductive plate, and holds the base terminal section into its relationship with the groove of support section 1a. In addition, the pressure spring tongue strip 5a is formed at the center section and held into relationship with the groove of spring stop section 1b. By forming this relationship, movable strip 5 is attached to common terminal 1. Movable contact 5b is also set at the tip of movable strip 5 and the precious metal contact material is fastened to the front and back of that strip. Movable contact 5b is between contacts 2a and 3a on the fixed side and is in opposition to both contacts 2 and 2b. The spring of movable strip 5 will, normally, cause movable contact 5b to pressure-contact with contact 3a. When pressure pushes movable strip 5 into operation, as the arrow shows, the snap action of movable strip 5 moves the pressure contact of movable contact 5b down to connect with the section 2a side. We should point out that the cover over the upper section of base 4 is omitted in this diagram but as with most microswitches a push-button cover is attached to operate movable strip 5.

Figure 2 shows one of the important points in producing this microswitch. First in Figure 2(A), 6 is the clad board in which the precious metal 8 such as silver has been previously belt inlaid into pure brass recipient plate 7. Terminals 1, 2 and 3, are formed in

continuous contact strip 9 by alternately punch-pressing clad board 6 at specified locations. This group of terminals strips, 1, 2 and 3 is considered as a unified body. The unified bodies are formed in continuous belts from clad board 6. Contact 2a in open-terminal strip 2 and contact 3a in close-terminal strip 3 are set so that they are in opposition. Open-terminal strip 2 and close-terminal strip 3 have been punched from the precious metal inlay in clad board 6. In other words, precious metal section 8 is located at the upper terminal insulating section of open-terminal strip 2 which is punched from clad board 6 and the lower insulating section of the upper terminal of close-terminal strip 3 is punched from the same board.

Figure 2(B) shows that unit terminals 1, 2 and 3 have been given an angular shape in the press, the tips of open-terminal strip 2 and close-terminal strip 3, are shaped at an appropriate angle and support section 1a is formed at the top of common terminal 1. /4

Figure 2(C) shows that terminals 1, 2 and 3 are inserted into and fixed to base 4. Continuous contact strip 9 is cut off and terminal strips 1, 2 and 3 are separated by insertion. It should be noted that continuous strip 9 can be cut off after resin molding or continuous contact strip 9 can be cut off while terminals strips 1, 2 and 3 are set in a forming die and the resin is molded. In either case the locations of base 4 and terminals 1, 2 and 3 will be extremely precise.

As Figure 1 shows, when movable strip 5 is fastened to common terminal strip 1, movable contact 5 is located between the angled tips of open terminal 2 and close-terminal 3. The precious metal inlaid section edges of terminal 2 and 3 are in opposition to movable contact 5b and those edge sections become contact sections 2a and 3a. It should be noted that in the example prototype in Figure 1, straight line contacts 2a and 3a, formed at the tip of precious metal inlay section 8, are located so that they are in opposition directly across movable contact 5 which is also set in a straight line. This forms the so-called cross-bar contact.

It should also be noted that it would, of course, be acceptable to locate precious metal inlay section 8 at contacts 2a and 3a of terminal strips 2 and 3, the latter having been punched from clad board 6. The location and formation of terminals 1, 2 and 3 and the location of inlay section 8 in regard to board 7, is not limited to those shown in Figure 2. For example, as Figure 3 shows, the unified bodies of terminal strips 1, 2 and 3 may be sequentially formed from clad board 6. We are also not limited to the example prototype shown in the chart for the processing of forming the angles terminals 2 and 3. And the edge of precious metal inlaid section 8 in terminal strips 2 and 3 does not have to be in opposition to movable contact 5b.

As the above explanation shows, the technique for manufacturing microswitches provided by this invention consists of five separate processing steps. In the first step, a clad board is inlaid with a precious metal. The board is then pressed. The press forms a unit body which has a series of alternating contact strips. There is at least one terminal strip on the side of the fixed contact. The strip or strips are arranged along one edge of the section inlaid with precious metal. The precious metal section becomes a fixed contact. There are also terminal strips on the movable strip side and these form the support section of the movable strip. The movable strip has movable contacts. The movable strip moves back and forth between the fixed strips. In the second processing step, one end of the fixed contact, containing a precious metal inlay section, is curved and /5
this edge of the precious metal inlay section becomes a fixed contact. In the third processing step, inserts are formed in the unit body and the terminal strips are placed through the tops and bottom of the base and held. The base is made from a synthetic resin insulating material. In the fourth step of the process, the unit body is held by the base and the sequential contact strips are cut off. This separates each of the terminal strips. In the fifth step of the process, movable strips are attached to the support section of the terminal strips on the movable side and the movable contacts are placed in opposition to the fixed contacts. By means of this invention, we eliminate the extremely difficult and time-consuming

process of attaching the contact section material to the terminal strips. This greatly simplifies the manufacturing process. It allows us to very precisely locate the positions between terminal strips. Highly precise location of the fixed contacts made from the precious metal section is easily performed by press processing. The invention is able to produce an extremely high-reliability microswitch in which connections between terminal strips and precious metal section remain stable. Also, since the fixed contact is placed on a slant in order to locate the movable contact in opposition to it, stability between contacts is upgraded and an even more reliable microswitch is attained. /6

Simplified Explanation of Charts

Figure 1 is a sketch showing one microswitch, in perspective, that was produced by the technique in this invention. Figure 2 is a diagram to explain the process of manufacturing the essentials to the invention. Figure 3 is a diagram explaining another example prototype of the invention.

1...common-terminal strip
2...open-terminal strip
3...close-terminal strip
3a..contact section
4...base
5...movable strip
5b..movable contact
6...clad board
8...precious metal inlay section

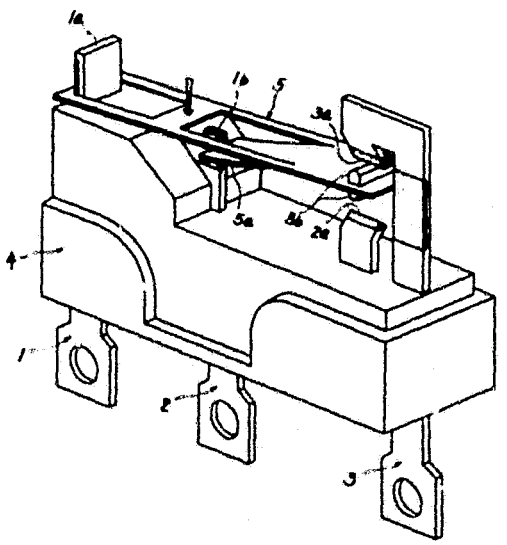

Figure 1

Figure 2

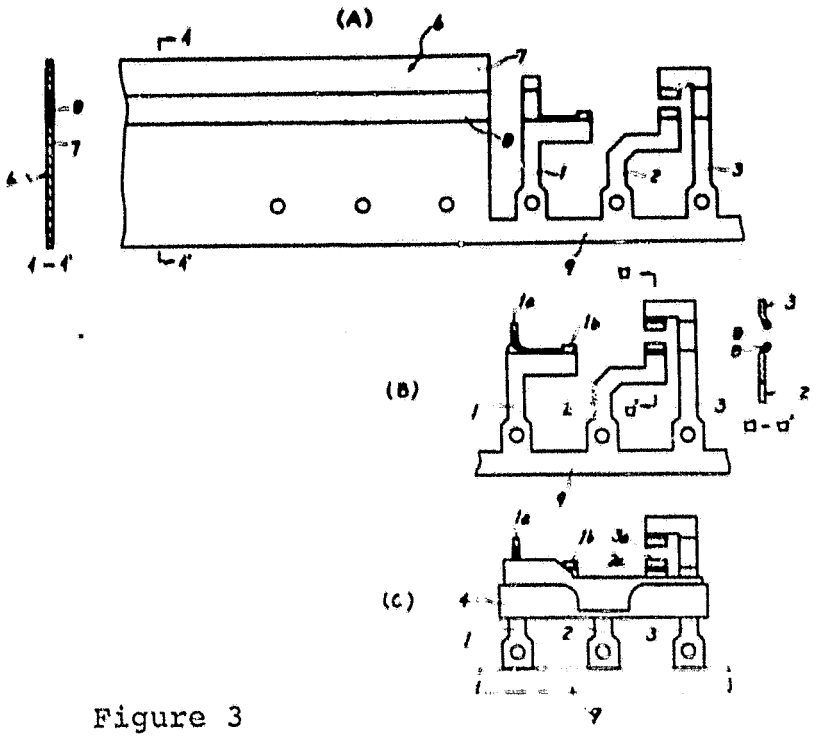

Figure 3